

ABSTRACT

A pharmaceutical composition for alleviating tissue hypoxia, comprising

- (1)  $\alpha$ -globin having the Titusville mutation,
- (2) a polynucleotide comprising a base sequence encoding an amino acid sequence of the  $\alpha$ -globin having the Titusville mutation, or
- (3) an expression vector comprising the polynucleotide, and a pharmaceutically acceptable carrier or diluent, is disclosed.

Further, a method for alleviating tissue hypoxia comprising administering the same to a subject, and a transgenic non-human animal having expressably a polynucleotide comprising a base sequence encoding an amino acid sequence of  $\alpha$ -globin having the Titusville mutation, are disclosed.